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CLAIM AMENDMENTS

Claims 8 to 22 have been withdrawn. Please amend claims 1 and 3 and add new claims 23 to 34 so that a complete listing of claims read as follows:

1. (Currently amended) A self-joining polymer composition, comprising:
a polymer;
a plurality of amine pendant groups attached to the polymer, the amine pendant groups being exposed on failure of the polymer; and
a plurality of microcapsules of flowable polymerizable material dispersed in the polymer, the microcapsules of flowable polymerizable material including microcapsules and flowable polymerizable material inside the microcapsules, the microcapsules effective for rupturing with a the failure of the polymer and the flowable polymerizable material cross-linking with the reactable pendant groups upon rupture of the microcapsules.
2. (Original) The self-joining polymer composition of claim 1, wherein the plurality of reactable pendant groups are attached to a backbone of the polymer.
3. (Currently amended) The self-joining polymer composition of claim 1, wherein the failure of the polymer comprises a crack having a first face and a second face, whereby the first face and the second face are opposing faces,
wherein a first portion of the plurality of reactable pendant groups is on the first face of the crack and a second portion of the plurality of reactable pendant groups is on the second face of the crack and
wherein cross-links are formed between the first portion and the second portion reactable pendant groups creating cross-linking between the opposing faces of the crack.

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4. (Original) The self-joining polymer composition of claim 1, wherein the microcapsule comprises a shell defining an interior space with the flowable polymerizable material disposed therein.

5. (Original) The self-joining polymer composition of claim 4, wherein the microcapsule shell comprises a material selected from the group consisting of hydrous metal oxide, silica, silicate, carbon, polymer, and combinations thereof.

6. (Original) The self-joining polymer composition of claim 1, wherein the flowable polymerizable material is selected from the group consisting of short and long chain dianhydrides and combinations thereof.

7. (Original) The self-joining polymer composition of claim 1, wherein the polymer is selected from the group consisting of epoxies, thermoset, thermoplastic, elastomeric, and combinations thereof.

8. (Withdrawn) A method for healing a failure in a composite member, the method comprising:

providing a composite member comprising a polymer, a plurality of reactable pendant groups attached to the polymer, and a plurality of microcapsules containing a flowable polymerizing agent dispersed throughout the polymer;

rupturing at least one of the plurality of microcapsules responsive to a failure in a region of the composite member;

releasing the flowable polymerizing agent responsive to the rupture;

cross-linking the flowable polymerizing agent with the plurality of reactable pendant groups in the failure region.

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9. (Withdrawn) The method of claim 8, wherein cross-linking the flowable polymerizing agent with the plurality of reactable pendant groups in the failure region comprises:

chemically bonding a first end of at least one flowable polymerizing agent molecule to a reactable pendant group on a first face of the failure;

chemically bonding a second end of the at least one flowable polymerizing agent molecule to a reactable pendant group on a second face of the failure, wherein the at least one bonded flowable polymerizing molecule prevents the failure from propagating within the composite member.

10. (Withdrawn) An article of manufacture comprising a self-joining polymer composition, the self-joining polymer composition comprising:

a polymer;

a plurality of reactable pendant groups attached to the polymer; and

a plurality of microcapsules containing a flowable polymerizable material dispersed in the polymer, the microcapsules effective for rupturing with a failure of the polymer wherein the flowable polymerizable material cross-links with the reactable pendant groups to join the failure.

11. (Withdrawn) The article of manufacture of claim 10, wherein the plurality of reactable pendant groups are attached to a backbone of the polymer.

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12. (Withdrawn) The article of manufacture of claim 10, wherein the failure of the polymer comprises a crack having a first face and a second face, whereby the first face and the second face are opposing faces, wherein a first portion of reactable pendant groups is on the first face and a second portion of the plurality of reactable pendant groups is on the second face of the crack and wherein cross-links are formed between the first portion and the second portion of the plurality of reactable pendant groups creating cross-linking between the opposing faces of the crack.

13. (Withdrawn) The article of manufacture of claim 10, wherein the article of manufacture is selected from the group consisting of aero-nautical structures, automotive parts, sporting equipment, construction material, electronic packages, electronic encapsulants, electronic die attach, plastic packaging, structural composites, display lenses/windows, flotation devices, pneumatic tire parts, adhesives, paints, sealants, impregnating resins, finishes, coatings, and parts and combinations thereof.

14. (Withdrawn) The article of manufacture of claim 10, wherein the flowable polymerizable material is selected from the group consisting of short and long chain dianhydrides and combinations thereof.

15. (Withdrawn) The article of manufacture of claim 10, wherein the polymer is selected from the group consisting of epoxies, thermoset, thermoplastic, elastomeric, and combinations thereof.

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16. (Withdrawn) An electronic package comprising:
a printed circuit board;
a semiconductor device attached to the printed circuit board by an adhesive; and
an encapsulant covering the semiconductor device and at least a portion of the printed circuit board,
at least one of the adhesive or encapsulant including a self-joining polymer composition, wherein the self-joining polymer comprises:
a polymer having a plurality of reactable pendant groups; and
a plurality of microcapsules containing a flowable polymerizable material dispersed in the polymer, the microcapsules effective for rupturing with a failure of the polymer wherein the polymerizable material cross-links with the reactable pendant groups to join the failure.

17 (Withdrawn) The electronic package of claim 16, wherein the plurality of reactable pendant groups are attached to a backbone of the polymer.

18. (Withdrawn) The electronic package of claim 16, wherein the failure of the polymer comprises a crack having a first face and a second face, whereby the first face and the second face are opposing faces, wherein a first portion of reactable pendant groups is on the first face and a second portion of the plurality of reactable pendant groups is on the second face of the crack and wherein cross-links are formed between the first portion and the second portion of the plurality of reactable pendant groups creating cross-linking between the opposing faces of the crack.

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19. (Withdrawn) A printed circuit board comprising a metal circuit pattern disposed on a board that includes a plurality of layers of fiber reinforced resin, wherein the resin includes a self-joining polymer composition comprising:

- a polymer;
- a plurality of reactable pendant groups attached to the polymer; and
- a plurality of microcapsules containing a flowable polymerizable material dispersed in the polymer, the microcapsules effective for rupturing with a failure of the polymer wherein the polymerizable material cross-links with the reactable pendant groups to join the failure.

20. (Withdrawn) The printed circuit board of claim 19, wherein the flowable polymerizable material is selected from the group consisting of short and long chain dianhydrides and combinations thereof.

21. (Withdrawn) The printed circuit board of claim 19, wherein the plurality of reactable pendant groups are attached to a backbone of the polymer.

22. (Withdrawn) The printed circuit board of claim 19, wherein the failure of the polymer comprises a crack having a first face and a second face, whereby the first face and the second face are opposing faces, wherein a first portion of reactable pendant groups is on the first face and a second portion of the plurality of reactable pendant groups is on the second face of the crack and wherein cross-links are formed between the first portion and the second portion of the plurality of reactable pendant groups creating cross-linking between the opposing faces of the crack.

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23. (New) The self-joining polymer composition of claim 3, wherein the first portion of reactable pendant groups on the first face are dangling from the first face and the second portion of reactable pendant groups on the second face are dangling from the second face

24. (New) The self-joining polymer composition of claim 23, wherein the dangling from the first face comprises dangling from an attachment to a polymer backbone on the first face and the dangling from the second face comprises dangling from an attachment to a polymer backbone on the second face.

25. (New) The self-joining polymer composition of claim 24, wherein the formed cross-links form a mesh-like web based on links, the links comprising the first portion of reactable pendant groups, released flowable polymerizable material and the second portion of reactable pendant groups, whereby the formed mesh-like web is attached to the polymer backbone on the first face and to the polymer backbone on the second face.

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26. (New) The self-joining polymer composition of claim 1,
wherein the failure of the polymer comprises a crack having a first face, a second face and a third face, whereby the first face and the second face are opposing faces, the second face and the third face are opposing faces and the first face and the third face are opposing faces,

wherein a first portion of the plurality of reactable pendant groups is on the first face of the crack and a second portion of the plurality of reactable pendant groups is on the second face of the crack and a third portion of the plurality of reactable pendant groups is on the third face of the crack, and

wherein cross-links are formed between the first portion and the second portion of reactable pendant groups, the second portion and third portion of reactable pendant groups, and the first portion and third portion of reactable pendant groups forming a cross-linking among all the opposing faces of the crack.

27. (New) The self-joining polymer composition of claim 26, wherein the first portion of reactable pendant groups on the first face are dangling from the first face, the second portion of reactable pendant groups on the second face are dangling from the second face and the third portion of reactable pendant groups on the third face are dangling from the third face.

28. (New) The self-joining polymer composition of claim 27, wherein the dangling from the first face comprises dangling from an attachment to a polymer backbone on the first face,

the dangling from the second face comprises dangling from an attachment to a polymer backbone on the second face, and

the dangling from the third face comprises dangling from an attachment to a polymer backbone on the third face.

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29. (New) The self-joining polymer composition of claim 28, wherein the formed cross-links form a mesh-like web based on links,
wherein the links are selected from the group consisting of
the first portion of reactable pendant groups, released flowable polymerizable material and the second portion of the plurality of reactable pendant groups,
the second portion of reactable pendant groups, released flowable polymerizable material and the third portion of the plurality of reactable pendant groups, and
the first portion of reactable pendant groups, released flowable polymerizable material and the third portion of the plurality of reactable pendant groups.

30. (New) The self-joining polymer composition of claim 29, whereby the formed mesh-like web is attached to the polymer backbone on the first face, the polymer backbone on the second face and the polymer backbone on the third face.

31. (New) The self-joining polymer composition of claim 1, wherein the functionality of the plurality of amine pendant groups attached to the polymer is obtained by modification of the polymer prior to formation of the self-joining polymer composition.

32. (New) A self-joining polymer composition, comprising:
means to form a mesh-like web attached to faces of a crack in the self-joining polymer.

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33. (New) The composition of claim 32, wherein the means to form a mesh-like web comprises:

- means to provide a flowable polymerizable material;
- means to provide a plurality of amine pendant groups attached to polymer backbones on opposing faces of a crack within the self-joining polymer; and
- means to link the flowable polymerizable material with amine pendant groups on the opposing faces to form a mesh-like web between polymer backbones on faces of the crack.

34. (New) A self-joining polymer composition, comprising:

- means to provide a flowable polymerizable material;
- means to provide a plurality of amine pendant groups attached to polymer backbones on opposing faces of a crack within the self-joining polymer; and
- means to link the flowable polymerizable material with amine pendant groups on the opposing faces to form a mesh-like web between polymer backbones on faces of the crack.